

FINAL REPORT
Indoor Air Quality Report
for
National Oceanic & Atmospheric Administration
Rooms 15860 and 15706,
Building SSMC-3,
1315 East-West Highway,
Silver Spring, Maryland
on July 9 & 17th, 2001
Interagency Agreement #: D8H01CO31200
Task: 0-14
August 29, 2001
Prepared by
US Public Health Service
Division of Federal Occupational Health
Bethesda Central Office

Executive Summary

At the request of Mr. Roy McCullough, National Oceanic & Atmospheric Administration (NOAA), Julie Sobelman, CIH, CSP from Federal Occupational Health (FOH) performed an indoor air quality investigation in rooms 15860 and 15706, Building SSMC-3, 1315 East-West Highway, Silver Spring, Maryland. Sampling included:

- Air, wipe, and vacuum dust samples for fungi
- Air samples for Volatile Organic Compounds (VOCs)
- Surface Wipes for fibrous glass
- Temperature, relative humidity, carbon dioxide, carbon monoxide

Additionally, visual inspection above ceilings for fibrous glass insulation was done to document potential sources of fibrous glass.

The investigation took place on July 9 and 17, 2001 (before and after cleaning of the designated space) following methodology described in this report.

Sample results indicate the total fungal concentration in the indoor space was generally higher on July 17th than on July 9th, while outdoor concentrations were lower. Fungal species were generally the same indoors and outdoors. No *Stachybotrys chartarum* was identified.

Results from VOC sampling were consistent on both dates sampled. The only VOC identified was methylene chloride at 0.86 ppm which is within acceptable indoor concentrations defined by AIHA, and below the OSHA permissible exposure limit of 25 ppm.

Fibrous glass was not identified on surface wipes, although it was observed above the office ceiling.

Temperatures within the offices and control space were slightly below the ASHRAE recommended range for summer.

Relative humidity, carbon monoxide and carbon dioxide were all found to be within acceptable indoor air quality criteria ranges.

Based upon visual observation and results of microbial sampling, FOH recommends both verification of reported office cleaning, and a thorough re-cleaning of the designated space. Visual inspection and microbial sampling should be repeated after cleaning to verify thoroughness of the work.

Introduction

The indoor air quality investigation described in the following report was performed before and after cleaning of the designated offices and appropriate control spaces. Sampling took place on July 9 and 17, 2001 utilizing methodologies outlined below.

Evaluation Methods

Microbial

Air samples for fungal contamination were collected by a culturable method using Andersen N-6 samplers at a flow rate of 28.3 L/min. Indoor Andersen air samples were collected for 3 minutes and outdoor samples were collected for both one and three minutes. Two percent (2 %) malt extract agar (MEA) and cellulose Czapek agar (CCA) was used to recover general fungi and cellulose-loving fungi, respectively.

The carpet dust sample procedure utilized insertion of a dust sample collection bag into the hose end of a HEPA vacuum cleaner, then assembling the vacuum attachment to the hose end to hold the sample collection bag in place. The vacuum end was cleaned with alcohol wipes between each sample. A 9ft² area was thoroughly vacuumed for 5 minutes.

Wipe samples were collected on BBL Culture Swabs. Three wipe samples were taken in each office and indoor control space. One wipe was taken on a supply diffuser, one on a return diffuser, and one from a solid furniture surface. Each surface sampled was swabbed over a 4 inch² area.

All samples were shipped overnight to FOH's Environmental Microbiology Laboratory (EML) in Philadelphia, PA.

Volatile Organic Compounds

Area air samples for VOCs were collected in each office and indoor control space. Samples were collected on Anasorb CSC charcoal tubes using Gillian sampling pumps adjusted for low flow applications. All equipment was calibrated (with sample media in line) before and after use to verify and average the flow rate at approximately 0.06 liters/minute. Flow rate on all pumps remained within 10% pre and post sampling.

Samples were shipped via overnight courier to the Travelers Industrial Hygiene Laboratory for analysis. The Travelers laboratory is accredited by the American Industrial Hygiene Association, Laboratory ID # 80.

Surface Wipes for Fibrous Glass

Surface samples for fibrous glass were collected by wiping a 4 inch² area with a 25mm 0.8 μ m MCE filter. Samples were collected on solid surfaces in each of the 2 offices and indoor control area. Samples were shipped via overnight courier to the Travelers Industrial Hygiene Laboratory for analysis.

Temperature, Relative Humidity, Carbon Monoxide and Carbon Dioxide

Temperature, relative humidity, carbon monoxide and carbon dioxide measurements were taken using a TSI Q-Trak Model 8551 IAQ monitor. Measurements were documented in both offices and indoor control space.

Laboratory Procedures

Microbial

Upon receipt, all Andersen air samples were incubated in a 25°C incubator.

Each vacuum dust sample was sieved through a 250 mm sieve. The fine dust (< 250 mm) retrieved was then weighed and followed the dilution plating for fungal analysis. At least three dilution series were used for each sample. Both MEA and CCA were used for retrieving fungi.

Wipe samples were plated for fungal analysis on both MEA and CCA media.

All plates were incubated in a 25°C incubator and were examined every other day for up to 10 days to ensure the full recovery of fungi. Fungal identification was based on colony morphology, spores and conidia formation. Total fungal colonies formed on each plate were counted and recorded. Fungal levels in samples were presented as colony forming units (CFUs) per measuring unit.

Volatile Organic Compounds

Samples for volatile organic compounds were analyzed using an in-house method involving sample desorption with carbon disulfide and analysis by Gas Chromatography/Mass Spectrometry (GC/MS).

Fibrous Glass

Wipe samples for fibrous glass were analyzed by microscopic examination following a modified EPA method for ID of Bulk Insulation Materials.

Standards/Criteria

Microbial

There are no “standards” for building microbial burden. Complaint areas are generally compared with non-complaint areas and outside air. For the purpose of this investigation, cleaned areas should result in reduction of fungal burden from previously un-cleaned areas.

Volatile Organic Compounds

“The Industrial Hygienist's Guide to Indoor Air Quality Investigations” published by the American Industrial Hygiene Association, Technical Committee on Indoor Environmental Quality, 1993, indicates an acceptable range for total volatile organic compounds (total hydrocarbons) to be 0-1.0 ppm.

Fibrous Glass

There are no “standards” for fibrous glass on furniture or building surfaces.

Temperature, Relative Humidity, Carbon Monoxide, Carbon Dioxide

ASHRAE Standard 55-1995 (Thermal Environmental Conditions for Human Occupancy) recommends temperatures in the range of 68-75°F in winter season and 73-79°F summer season. These ranges are based on a 10% dissatisfaction criterion. The recommended relative humidity range is 30 - 60%.

Carbon monoxide levels should be 0-2 parts per million (ppm) above ambient, < 9 ppm average. Carbon Dioxide levels should remain < 850 ppm ("Industrial Hygienist's Guide to Indoor Air Quality Investigations" published by the American Industrial Hygiene Association, Technical Committee on Indoor Environmental Quality). ASHRAE 62-1999 recommends indoor carbon dioxide levels no greater than 700 ppm higher than outdoor levels (outdoor levels generally range from 300-500 ppm).

Results and Conclusions

Microbial results are tabulated in Attachment A. *Stachybotrys chartarum* was not identified in any of the samples collected. Total airborne fungal concentrations on July 17th were higher than those found on July 9th, wipe sample results from return diffusers were higher on July 17th than on July 9th (other wipes remained similar), and total fungal concentrations in carpet was higher on July 17th than on July 9th. Outdoor fungal concentrations were lower on July 17th than on July 9th. Species identified were similar on both dates sampled. Indoor species identified were similar to those identified outside.

Results from VOC sampling were the same on July 9 and 17th. Both samples collected in room 15860 identified methylene chloride at a level of 3.0 mg/M³ (0.86 ppm). No compounds above the analytical limit of quantitation were detected in any of the other samples. Laboratory results from VOC analysis are located in Attachment B. Methylene chloride is solvent generally found in paint strippers and parts cleaners. It is also used as a propellant in aerosol cans. No obvious visible source of methylene chloride was observed in the space. Methylene chloride may be a component of a cleaning or maintenance product used in the offices, or as an aerosol propellant of a product used in the offices. The level of methylene chloride identified is within the AIHA acceptable range of 0-1.0 ppm for VOCs, and well below the OSHA permissible exposure limit of 25 ppm.

Fibrous glass was not detected in any of the wipe samples collected. Sample results are located in Attachment B. Fibrous glass batting was observed intermittently above office ceilings. Flex duct with fibrous glass between two plastic layers was also observed.

Temperature, relative humidity, carbon dioxide, and carbon monoxide measurements by location were documented as follows.

Date	Location	Temperature °F	Relative Humidity (%)	Carbon Monoxide (PPM)	Carbon Dioxide (PPM)
7/9/01	15860	67.3	44.6	0	611
7/9/01	15706	69.8	46.7	0	689
7/9/01	15724	70.5	44.9	0	625
7/17/01	15860	68.0	44.7	0	679
7/17/01	15706	68.7	45.2	0	656
7/17/01	15724	71.5	42.9	0	683

Temperatures measured were slightly below the ASHRAE recommended summer temperature range of 73-75 °F. All other parameters were within acceptable ASHRAE and AIHA criteria guidelines.

There was no observable difference in the condition of the offices 15860, 15706 and the control space 15724 between July 9th and 17th. Although the offices were reported to have been cleaned between the two sampling dates, visible dust remained on diffusers and office surfaces.

Recommendations

Based upon visual observation and results of microbial sampling, FOH recommends both verification of reported office cleaning, and a thorough re-cleaning of the designated space. Visual inspection and microbial sampling should be repeated after cleaning to verify thoroughness of the work.

[Attachment A](#)

Microbial Results

[Attachment B](#) (pdf file)

VOC and Fibrous Glass Sample Results

USPHS DFOH ENVIRONMENTAL MICROBIOLOGY LABORATORY, PHILADELPHIA, PA

LABORATORY REPORT #NOAA-01-15R

Client agency: National Oceanic and Atmospheric Administration, Silver Spring, MD

POIS#/task #: D8H00CO31200 / pending

Sampling date: 7/9/01

Dates of inoculation: 7/9/01 (airs), 7/10/01 (wipes and dust)

General location: SSMC-3, Silver Spring, MD

Specific location: 15th floor

Sampling techniques: Air (Andersen N-6 sampler), wipe, and vacuum dust samplings

Medium used: Malt extract agar (MEA) and cellulose Czapek agar (CCA) for fungi

Samples submitted by: J. Sobelman

Date characterization completed: 7/20/01

(A) Air samples on MEA and CCA plates

Sample ID	Sampling Location	Air Volume (L)	Fungi on MEA @ 25° C	<i>Stachybotrys chartarum</i> on CCA @ 25° C
15860-1	15 th floor, office 15860	84.9	1. <i>Penicillium</i> (1*) CFU/m ³ = 12	Absent
15706-2	15 th floor, office 15706	84.9	1. <i>Aureobasidium</i> (1) 2. <i>Cladosporium</i> (1) CFU/m ³ = 24	Absent

15724-3	15 th floor, office 15724	84.9	1. <i>Cladosporium</i> (2) 2. <i>Paecilomyces</i> (1) CFU/m ³ = 35	Absent
OA1	P-outside	84.9	1. <i>Cladosporium</i> (107) 2. <i>Alternaria</i> (8) 3. <i>Rhizopus</i> (1) CFU/m ³ = 1,366	Absent
OA2	P-outside	28.3	1. <i>Cladosporium</i> (26) 2. <i>Aureobasidium</i> (1) 3. <i>Paecilomyces</i> (1) 4. Basidiomycetes (3) CFU/m ³ = 1,095	Absent

(B) Wipe samples on MEA and CCA plates

Sample ID	Sampling Location	Area (in ²)	Dilution factor	Fungi on MEA @ 25°C	<i>Stachybotrys chartarum</i> on CCA @ 25°C
15860-W1	15 th floor, office 15860, supply	4	10X-MEA 10X-CCA	No fungal growth CFU/in ² < 3	Absent
15860-W2	15 th floor, office 15860, return	4	10X-MEA 10X-CCA	1. <i>Aspergillus sp.</i> (2) 2. <i>Cladosporium</i> (1) 3. Basidiomycetes (1) CFU/in ² = 10	Absent
15860-W3	15 th floor, office 15860, desk	4	10X-MEA 10X-CCA	No fungal growth CFU/in ² < 3	Absent
15706-W4	15 th floor, office 15706, supply	4	10X-MEA 10X-CCA	No fungal growth CFU/in ² < 3	Absent
15706-W5	15 th floor, office 15706, return	4	10X-MEA 10X-CCA	1. <i>Cladosporium</i> (1) CFU/in ² = 3	Absent
15706-W6	15 th floor, office 15706, desk	4	10X-MEA 10X-CCA	No fungal growth CFU/in ² < 3	Absent
15724-W7	15 th floor, office 15724, supply	4	10X-MEA 10X-CCA	1. <i>Penicillium</i> (1) CFU/in ² = 3	Absent

15724-W8	15 th floor, office 15724, return	4	10X-MEA 10X-CCA	1. <i>Penicillium</i> (1) CFU/in ² = 3	Absent
15724-W9	15 th floor, office 15724, desk	4	10X-MEA 10X-CCA	No fungal growth CFU/in ² < 3	Absent
LB	Lab Blank	NA [#]	10X-MEA 10X-CCA	No fungal growth	Absent

(C) Vacuum dust samples on MEA and CCA plates

Sample ID	Sampling Location	Weight (g)	Dilution factor	Fungi on MEA @ 25°C	<i>Stachybotrys chartarum</i> on CCA @ 25°C
15860-VD1	15 th floor, carpet 15860	0.104	400X-MEA 10X-CCA	1. <i>Aspergillus sp.</i> (13) 2. <i>Alternaria</i> (2) CFU/g = 5.8 x 10 ⁴	Absent
15706-VD2	15 th floor, carpet, 15706	0.105	400X-MEA 10X-CCA	1. <i>Aspergillus sp.</i> (29) 2. <i>Aureobasidium</i> (1) CFU/g = 1.1 x 10 ⁵	Absent
15724-VD3	15 th floor, carpet, 15724	0.103	40X-MEA 10X-CCA	1. <i>Cladosporium</i> (13) 2. <i>Alternaria</i> (5) 3. <i>Epicoccum</i> (3) 4. <i>Penicillium</i> (2) 5. Basidiomycetes (6) CFU/g = 1.1 x 10 ⁴	Absent

* Colony counts.

Not applicable.

USPHS DFOH ENVIRONMENTAL MICROBIOLOGY LABORATORY, PHILADELPHIA, PA

LABORATORY REPORT #NOAA-01-16R

Client agency: National Oceanic and Atmospheric Administration, Silver Spring, MD

POIS#/task #: D8H00CO31200 / 9903

Sampling date: 7/17/01

Dates of inoculation: 7/17/01 (airs) and 7/18/01 (wipes and dust)

General location: SSMC-3, Silver Spring, MD

Specific location: 15th floor

Sampling techniques: Air (Andersen N-6 sampler), wipe, and vacuum dust samplings

Medium used: Malt extract agar (MEA) and cellulose Czapek agar (CCA) for fungi

Samples submitted by: J. Sobelman

Date characterization completed: 7/30/01

(A) Air samples on MEA and CCA plates

Sample ID	Sampling Location	Air Volume (L)	Fungi on MEA @ 25° C	<i>Stachybotrys chartarum</i> on CCA @ 25°C
A1	15 th floor, control-conference 15724	84.9	1. <i>Cladosporium</i> (7*) 2. <i>Alternaria</i> (1) CFU/m ³ = 94	Absent
A2	15 th floor, 15706	84.9	1. <i>Cladosporium</i> (10) CFU/m ³ = 118	Absent
A3	15 th floor, 15860	84.9	1. <i>Cladosporium</i> (6) 2. <i>Aureobasidium</i> (2) 3. <i>Alternaria</i> (1) 4. yeast (2) CFU/m ³ = 130	Absent
OA1-C, M	Outside	84.9	1. <i>Cladosporium</i> (12) 2. <i>Penicillium</i> (6) 3. <i>Aspergillus fumigatus</i> (2) 4. <i>Aureobasidium</i> (2) 5. <i>Paecilomyces</i> (1) CFU/m ³ = 271	Absent
Sample ID	Sampling Location	Air Volume (L)	Fungi on MEA @ 25° C	<i>Stachybotrys chartarum</i> on CCA @ 25°C

OA2-C, M	Outside	28.3	1. <i>Cladosporium</i> (10)	Absent
			2. <i>Alternaria</i> (3)	
			3. <i>Penicillium</i> (2)	
			CFU/m ³ = 530	

(B) Wipe samples on MEA and CCA plates

Sample ID	Sampling Location	Area (in ²)	Dilution factor	Fungi on MEA @ 25°C	<i>Stachybotrys chartarum</i> on CCA @ 25°C
LB	Lab blank	NA [#]	10X-MEA 10X-CCA	No fungal growth	Absent
W1	15 th floor, desk 15860	4	10X-MEA 10X-CCA	No fungal growth CFU/in ² < 3	Absent
W2	15 th floor, supply 15860	4	10X-MEA 10X-CCA	No fungal growth CFU/in ² < 3	Absent
W3	15 th floor, return 15860	4	40X-MEA 10X-CCA	1. <i>Aureobasidium</i> (24) 2. <i>Penicillium</i> (1) CFU/in ² = 250	Absent
W4	15 th floor, desk 15706	4	10X-MEA 10X-CCA	No fungal growth CFU/in ² < 3	Absent
W5	15 th floor, supply 15706	4	10X-MEA 10X-CCA	No fungal growth CFU/in ² < 3	Absent
W6	15 th floor, return 15706	4	40X-MEA 10X-CCA	1. <i>Aureobasidium</i> (3) CFU/in ² = 30	Absent
W7	15 th floor, conference table 15724	4	10X-MEA 10X-CCA	1. yeast (3) CFU/in ² = 8	Absent

Sample ID	Sampling Location	Area (in ²)	Dilution factor	Fungi on MEA @ 25°C	<i>Stachybotrys chartarum</i> on CCA @ 25°C
W8	15 th floor, supply 15724	4	10X-MEA 10X-CCA	No fungal growth CFU/in ² < 3	Absent

W9	15 th floor, return 15724	4	40X-MEA 10X-CCA	1. <i>Aureobasidium</i> (2) 2. <i>Penicillium</i> (1) 3. yeast (2) CFU/in ² = 50	Absent
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(C) Vacuum dust samples on MEA and CCA plates

Sample ID	Sampling Location	Weight (g)	Dilution factor	Fungi on MEA @ 25°C	Stachybotrys chartarum on CCA @ 25°C
VD1	15 th floor, office 15860, carpet	0.101	400X-MEA 10X-CCA	1. <i>Aspergillus sp.</i> (12) 2. <i>Alternaria</i> (3) 3. <i>Cladosporium</i> (3) 4. <i>Neurospora</i> (1) CFU/g = 7.5 x 10 ⁴	Absent
VD2	15 th floor, office 15706, carpet	0.102	400X-MEA 10X-CCA	1. <i>Alternaria</i> (1) 2. <i>Aspergillus sp.</i> (1) 3. <i>Cladosporium</i> (1) 4. <i>Rhizopus</i> (1) CFU/g = 1.6 x 10 ⁴	Absent

Sample ID	Sampling Location	Weight (g)	Dilution factor	Fungi on MEA @ 25°C	<i>Stachybotrys chartarum</i> on CCA @ 25°C
VD3	15 th floor, 15724, carpet	0.101	400X-MEA 10X-CCA	1. <i>Cladosporium</i> (18) 2. <i>Alternaria</i> (1) 3. <i>Aureobasidium</i> (1) 4. <i>Penicillium</i> (1) 5. Ascomycetes (3) CFU/g = 9.5 x 10 ⁴	Absent

* Colony counts.

Not applicable.
